First National Environmental Health Survey of Child Care Centers

FINAL REPORT
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Volume II: Analysis of Allergen Levels on Floors

Prepared for:

Office of Healthy Homes and Lead Hazard Control
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, D.C. 20410

By:

Susan M. Viet, Ph.D., CIH
John Rogers, MS
David Marker, Ph.D.
Alexa Fraser, Ph.D.
Melissa Bailey, MPH

Westat, Inc.
1650 Research Boulevard
Rockville, MD 20850

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EXECUTIVE SUMMARY

The First National Environmental Health Survey of Child Care Centers (referred to here as the CCC Survey) was conducted under the sponsorship of the Department of Housing and Urban Development (HUD), the Environmental Protection Agency (EPA), and the Consumer Product Safety Commission (CPSC) to assess children's potential exposure to lead, allergens, and pesticides in licensed child care centers that serve children under age 6 in the 48 contiguous United States. Lead levels were estimated in settled dust, paint, and play area soil; indoor allergen (allergy-inducing substance) levels were measured in settled dust; and pesticide residues were determined on indoor surfaces and play area soils.

This report, Volume II, includes the findings for allergens in dust in the nation's child care centers by the building's age, type, and geographical location, and population demographics. The survey technicians collected vacuum samples from floors in the randomly selected classrooms and multipurpose rooms within selected child care centers.

Allergens in Child Care Centers

Asthma is a chronic lung disorder afflicting 8-12% of children nationwide and having costs of over $6.2 billion/year (NHLBI, 1991; Weiss et al, 1992). The association between asthma and allergy is highlighted by the fact that over 70% of asthmatics have positive immediate skin test reactions to common inhalant allergens (Sporik et al., 1990). It is important to assess child care centers for allergens because millions of children spend much of their time at child care centers. Indoor dust contains a mixture of allergens from domestic animals (cats, dogs, and birds), insects, microscopic arthropods, bacteria, and fungi. In this study, dust samples were analyzed for the two house-dust mite allergens, *Dermatophagoides pteronyssinus* allergen 1 (*Der p* 1) and *Dermatophagoides farinae* allergen 1 (*Der f* 1) and the cockroach allergen *Blattella germanica* allergen 1 (*Bla g* 1).

The principal purpose for the allergen portion of the survey was to develop a scientific description of the existing allergen types and levels in floor dust in the Nation's licensed child care centers, including estimates of the number and percent of child care centers with allergen levels above thresholds that may be related to asthma and allergies (dust mite allergen above 10 μg/g dust; cockroach allergen above 8 units/g dust). In particular, it is important to evaluate differences in allergen exposures as a function of geographic region, ethnic group, socioeconomic status, and/or building characteristics, so that specific asthma interventions can be tailored to a given area, population, or housing type.

The vacuumed dust samples were assayed for the three target allergens. Each assay resulted in one of three possible outcomes: 1) there was an insufficient quantity of dust for extraction and analysis; 2) the allergen concentration was below the lower limit of detection (LLOD) of the test, or 3) a measured concentration of the allergen was provided. In order to have a numeric result for all assays reported, when the reported concentration was below the LLOD, it was imputed as one-half of the LLOD.

There was insufficient dust for analysis in 26 percent of child care centers. This is, in itself, an interesting finding. It is assumed that low dust quantities are due to regular cleaning and vacuuming of floors conducted by licensed childcare centers (94% of centers reported having daily cleaning).

Only 13-15 percent of child care centers had detectable levels of each of the three allergens assayed and reported. Less than 22 percent of licensed child care centers had detectable levels of any of the three allergens tested. The distributions of all three allergens are skewed, with long right tails, showing that the allergen concentrations are low in most of the child care centers. Although the majority of centers have low allergen levels, a number have levels above thresholds – levels high enough that they could trigger asthma and allergies. Eight percent of centers had at least one allergen with concentrations that may be associated with the development of allergies.

Correlations scatter plots and cross tabulations were used to assess the relationships between the three allergen measurements. All of the correlations were close to zero and none were statistically significant. The lack of significance suggests that there is no strong common factor that predicts which centers have measurable allergen levels. This may in part be due to the relatively larger number of observations below the detection limit.

Tests were used to identify statistically significant differences in allergen levels among child care centers classified by child care center characteristics, including year of construction, majority race, urban city, percent of children getting government subsidies, whether children at the center have allergies or asthma, how often the center is cleaned and by whom, type of heat and air conditioning, and whether the center has cockroach problems, dampness, a mildew or musty smell, indoor pesticide application, and dehumidifier use. None of the statistical tests were significant. Differences in allergen levels between classrooms and multipurpose rooms were also not significant. Once again, the lack of significant differences may, in part, be due to the relatively large number of observations below the detection limit.

The lack of statistically significant differences and the small number of centers with detectable allergen levels has implications for future research. If assessment of allergen concentrations is important even when there is little dust present, samples must be collected from a surface area larger than the 18 square feet used in this study. If identifying predictors of detectable or high allergen concentrations is important, it will be necessary to collect data from a larger sample of centers.

Survey Design and Methodology

In order to meet the survey objectives, a nationally-representative sample of 334 licensed child care centers was drawn from 30 clusters called *primary sampling units* (PSUs).[1] A general two-stage sample design was utilized to accomplish these goals as efficiently as possible. A total of 168 eligible centers (licensed, with children under 6, located in the contiguous United States) were recruited into the survey. In each recruited center, samples of dust and soil were collected and painted surfaces were tested for lead using licensed inspectors. Unlicensed day care centers were not included in this survey.

Only classrooms and "multipurpose" rooms (e.g., cafeterias, libraries, ballrooms, and gymnasiums) where children under 6 regularly spent time were included in the study. All classrooms were enumerated on one list, while all such multipurpose rooms were enumerated on another. Up to two classrooms and two multipurpose rooms were then randomly sampled from the lists. A total of 336 rooms were sampled.

Within each sampled room, one floor allergen dust sample was collected by vacuuming a measured area (minimum of 3 feet by 6 feet) adjacent to a sink. If there was no sink in the room, the allergen sample was collected along a randomly selected wall.

A questionnaire was administered to each center director a few weeks after the field visit. All samples and questionnaire data were collected between July and October 2001.

[1] A PSU is a metropolitan statistical area (MSA), county, or cluster of counties that has a minimum population of 15,000 and does not cross Census region boundaries.

1. INTRODUCTION

The First National Environmental Health Survey of Child Care Centers was conducted under the sponsorship of the Department of Housing and Urban Development (HUD), the Environmental Protection Agency (EPA), and the Consumer Product Safety Commission (CPSC) to assess children's potential exposure to lead, allergens, and pesticides in licensed child care centers. Lead levels were estimated in dust, paint, and play area soil; indoor allergen (allergy-inducing substance) levels were measured in dust; and pesticide residues were determined on indoor surfaces and play area soils. Combining the goals of HUD, EPA, and CPSC into a single survey saved significant public funds, reduced the survey response burden on the public, and substantially reduced the time required to obtain the data needed by all agencies for their ongoing primary and secondary prevention activities.

The report for the First National Environmental Health Survey of Child Care Centers consists of four volumes: This report, Volume II, describes allergen levels in the nation's child care centers by building age, type, geographical location, and exposed populations. Volume I presents the major lead hazard findings. Volume III presents the overall survey design and methodology. Volume IV presents documentation for the data files and derived variables used for the analyses.

1.1 Background

Asthma is a chronic lung disorder of enormous public health importance, afflicting 8-12% of children nationwide and having costs of over $6.2 billion/year (NHLBI, 1991; Weiss et al, 1992). The association between asthma and allergy is highlighted by the fact that over 70% of asthmatics have positive immediate skin test reactions to common inhalant allergens (Sporik et al., 1990). It is important to assess child care centers for allergens because millions of children spend much of their time at child care centers. Indoor dust contains a mixture of allergens from domestic animals (cats, dogs, and birds), insects, microscopic arthropods, bacteria, and fungi. Several studies have demonstrated that sensitization to the house-dust mite allergens *Dermatophagoides pteronyssinus* allergen 1 (*Der p* 1) and *Dermatophagoides farinae* allergen 1 (*Der f* 1) are strongly associated with asthma (Sporik et al., 1990; Sears et al., 1989). In low-income areas, sensitivity to the cockroach allergens *Blattella germanica* allergen 1 (*Bla g* 1) and *Blattella germanica* allergen 2 (*Bla g* 2) are also important (Pollart et al., 1991; Rosenstreich et al., 1997), although no studies have adequately addressed the relative importance of these two major groups of aeroallergens in the pathogenesis of asthma.

A national survey of homes showed that 54% of homes have dust mite allergen levels in bedding that exceed levels that may be associated with sensitization, while 10% of homes have cockroach allergen levels above such thresholds (HUD, 2000). To date, there have been no studies on the levels of allergens in child care centers nationwide. A number of small, focused studies have measured the levels of allergens in child care centers in a defined locale. Although these focused studies have provided important data on the relation between allergens and allergy/asthma in selected populations, they have not permitted estimates of allergen exposure in the national population, addressed the national magnitude of the allergen problem, nor evaluated differences in allergen exposure. Importantly, most of the allergen measurements have been made in child care centers of allergic/asthmatic children and/or adults. Levels typically found in a subgroup of child care centers are probably not representative of the entire nation. Thus, there was a tremendous need for a population-based survey of allergens in child care centers. In particular, it is important to evaluate differences in allergen exposures as a function of geographic region, ethnic group, socioeconomic status, and/or building characteristics, so that specific asthma interventions can be tailored to a given area, population, or housing type.

1.2 Study Objectives

The principal purpose for the allergen portion of the survey was to develop a scientific description of the existing allergen types in floor dust in the Nation's licensed child care centers. In addition, the survey of allergens in child care centers provided:

i. Estimates of the number and percent of child care centers with allergen levels above thresholds that may be related to asthma and allergies (dust mite allergen above 10 μg/g dust; cockroach allergen above 8 units/g dust).

ii. A baseline that can be used as a reference point for future allergen surveys.

1.3 Summary of Study Design

In order to meet the survey objectives, a nationally-representative sample of 334 child care centers was drawn from 30 clusters called *primary sampling units* (PSUs).[2] The 30 PSUs were randomly selected from 1389 PSUs across the continental United States. Of the 334 sampled centers, 68 were not

[2] A PSU is a metropolitan statistical area (MSA), county, or cluster of counties that has a minimum population of 15,000 and does not cross Census region boundaries.

eligible for the survey. Of the remaining 266 eligible centers, a total of 168 eligible centers (licensed, with children under 6, located in the contiguous United States) were recruited and completed the survey, for a completion rate of 70.7 percent.

The sample was to be restricted to licensed child care centers in the 48 contiguous United States and District of Columbia. While it would be of interest to collect information from all forms of child care facilities, no lists of non-licensed centers existed from which to select a sample. To survey non-licensed, home-based centers would require a national sample of homes, whose occupants would then be asked if they provide child care from their homes. It would be possible to include licensed home-based child care, but information on lead and allergens in homes with children can be obtained from the recently completed National Survey of Lead and Allergens in Housing. This provides some insight into the situation in both licensed and non-licensed home-based child care. Thus it was decided to focus the current survey on larger, generally not home-based child care centers.

Only classrooms and "multipurpose" rooms (e.g., cafeterias, libraries, ballrooms, and gymnasiums) where children under age 6 regularly spent time were included in the study. All classrooms were enumerated on one list, while all multipurpose rooms were enumerated on another. Rooms were then randomly sampled from each list.

Within each sampled room, one floor allergen dust sample was collected by vacuuming a measured area (minimum of 3 feet by 6 feet) adjacent to a sink.[3] If there was no sink in the room, the allergen sample was collected along a randomly selected wall.

The dust sampling method used for allergens was the Mighty Mite vacuum (fitted with a thimble). Vacuuming was conducted for 5 minutes for each allergen dust sample. Sample location data were recorded, including the total surface area vacuumed, the type of flooring (carpet, uncarpeted, or a mixture), the temperature and humidity in each room, and the presence of air conditioning devices, food debris, moisture, cockroaches, and rodents. A questionnaire was administered to each center director a few weeks after the field visit. All data were collected between July and October 2001.

Further details on the design and methodology are presented in Volume III.

[3] It was thought that cockroach allergens might be higher near a water source.

2. DATA SUMMARY

This report presents data summaries for three selected allergens - *Bla g* 1, *Der p* 1, and *Der f* 1 - found in vacuum dust samples collected from floors in the participating child care centers. Also presented are summaries of selected allergen-related questions asked of the center directors and observations made in the center. The summary information presented below is based only on the classrooms and multipurpose rooms sampled in the child care centers.

2.1 Analytical Results

The vacuumed dust samples were assayed for the three target allergens. Each assay resulted in one of three possible situations. First, in many cases, the sample did not contain sufficient dust for extraction and analysis. Second, the numeric result fell between the LLOD (lower limit of detection) and the ULOD (upper limit of detection). Third, the indicated concentration was below the LLOD. In the last situation, a numeric value could not be reported for the concentration. In order to have a numeric result for all assays reported, when the reported concentration was below the LLOD, it was imputed as one-half of the LLOD. Table 2-1 summarizes the LLOD and ULOD levels for the three allergens.[4]

Table 2-1 Limits of detection for allergen assays

Allergen	Measurement Units	Range of LLODs	Range of ULODs
Der p 1	µg/gm	0.1 to 0.2	76 to 193
Der f 1	µg/gm	0.1 to 0.2	105 to 306
Bla g 1	Units/gm	0.2 to 0.5	196 to 1070

Notes: 1) LLOD = Lower Limit of Detection, ULOD = Upper Limit of Detection
2) The Limit of Detection varied among samples, for example, when the extraction volume was adjusted because of a small amount of dust.

[4] No samples had an allergen level above the ULOD.

The fourth allergen reported is the sum of the two dust mite allergens, *Der p* 1 plus *Der f* 1. Since one or both of these allergens could be missing or below the ULOD, the following algorithm was adopted[5]:

- If both *Der* values were missing, their sum was missing;
- If one of the *Der* values was missing, the sum was the other non-missing value.
- If both *Der* values were below their respective LLODs, then the "sum" was the smaller of the LLODs for Der *p* 1 and *Der f* 1, divided by two.[6]
- Otherwise, the sum = *Der p* 1 + *Der f* 1.

2.2 National Estimates of Allergen Levels

Basic summary statistics were generated for allergen samples collected from floors and assayed for three primary allergens, *Bla g* 1, *Der p* 1, and *Der f* 1. Table 2-2 presents, for different ranges of each allergen, the sampled and weighted number of child care centers, percent of centers, and cumulative percent of centers that fall with a given allergen concentration range.

Table 2-2 shows that there was insufficient dust for analysis in 26 percent (19-35%)[7] of child care centers. This is, in itself, an interesting finding. It is assumed that low dust quantities are due to regular cleaning and vacuuming of floors conducted by licensed childcare centers (94% of centers reported having daily cleaning). However, no conclusions can be made about the allergen content of the dust, albeit a small quantity, for these centers.

[5] This algorithm was also used for the *National Survey of Lead and Allergens in Housing* (HUD, 2000)

[6] This is comparable to using half the LLOD for an individual allergen.

[7] CI = Confidence interval at the 95% level for estimated number or percent.

Table 2-2 Number and percentage of centers with allergens within selected ranges

***Bla g* 1**							
Range, in Units/gram	**Estimated Number of Centers**			**Estimated Percent of Centers**			**Sample Size**
	Number	**Lower 95% CI**	**Upper 95% CI**	**Percent**	**Lower 95% CI**	**Upper 95% CI**	
<LLOD	56,983	46,194	67,771	57	46	67	102
<= 0.5	56,983	46,194	67,771	57	46	67	102
<= 1.0	56,983	46,194	67,771	57	46	67	102
<= 2.0	56,983	46,194	67,771	57	46	67	102
<= 5.0	67,562	56,623	78,500	68	57	76	118
<= 8.0	69,045	57,874	80,215	69	59	78	120
> 8.0	3,321	1,066	9,870	3	1	10	4
Insufficient Quantity	26,263	17,337	35,188	26	19	35	42
Missing	1,323			1			2
Total	99,952			100			168

***Der f* 1**							
Range, in μg/g	**Estimated Number of Centers**			**Estimated Percent of Centers**			**Sample Size**
	Number	**Lower 95% CI**	**Upper 95% CI**	**Percent**	**Lower 95% CI**	**Upper 95% CI**	
<LLOD	58,427	49,020	67,835	58	52	65	98
<= 0.5	58,749	49,328	68,170	59	52	65	99
<= 1.0	58,953	49,629	68,277	59	52	66	100
<= 2.0	64,894	55,335	74,453	65	58	71	111
<= 5.0	70,484	59,879	81,089	71	63	77	120
<= 10.0	71,331	60,630	82,033	71	63	78	122
> 10.0	1,423	431	4,598	1	0	5	3
Insufficient Quantity	26,263	17,337	35,188	26	19	35	42
Missing	935			1			1
Total	99,952			100			168

Table 2-2 Number and percentage of centers with allergens within selected ranges (continued)

Range, in µg/g	Estimated Number of Centers			Estimated Percent of Centers			Sample Size
	Number	Lower 95% CI	Upper 95% CI	Percent	Lower 95% CI	Upper 95% CI	
***Der p* 1**							
<LLOD	59,454	49,138	69,771	59	50	68	104
<= 0.5	59,973	49,557	70,388	60	50	69	105
<= 1.0	62,239	51,954	72,525	62	54	70	108
<= 2.0	67,599	56,468	78,730	68	58	76	116
<= 5.0	68,149	56,964	79,335	68	58	77	117
<= 10.0	69,941	59,089	80,793	70	61	78	120
> 10.0	2,813	989	7,743	3	1	8	5
Insufficient Quantity	26,263	17,337	35,188	26	19	35	42
Missing	935			1			1
Total	99,952			100			168
***Der p* 1 + *Der f* 1**							
<LLOD	49,316	40,146	58,486	49	41	57	85
<= 0.5	49,638	40,424	58,852	50	41	58	86
<= 1.0	51,107	42,395	59,819	51	44	59	89
<= 2.0	59,736	50,217	69,255	60	52	67	103
<= 5.0	65,986	55,034	76,937	66	57	74	113
<= 10.0	68,518	57,899	79,137	69	60	76	117
> 10.0	4,237	779	7,694	4	2	9	8
Insufficient Quantity	26,263	17,337	35,188	26	19	35	42
Missing	935			1			1
Total	99,952			100			168

CI = Confidence limit for a 95% confidence interval for the estimated number or percent
Values may not add to the total due to rounding
Percentages use 99,952 Centers as the denominator

Between 13-15 percent of child care centers had detectable levels of each of the three allergens assayed and reported. (For example for *Bla g* 1, 1 percent of centers had missing data, 26 percent of centers have an insufficient quantity of dust for analysis, and 57 percent had allergen concentrations below the LLOD. This leaves only 15 percent measured above the LLOD[8]). Only 22 percent of licensed child care centers had detectable levels of any of the three allergens tested. Less than 4% had levels of any one allergen in the ranges that may be associated with development of allergies in children. Eight percent of centers had at least one allergen with concentrations that may be associated with development of allergies.

Table 2-3 presents statistics on the distributions of the three primary allergens on floors of child care centers. Box plots of allergen levels follow in Figures 2-1 and 2-2. The distributions of all three allergens are skewed, with long right tails, showing that the allergen concentrations are low in most of the child care centers. Although the majority of centers have low allergen levels, a number have levels above thresholds that may be related to asthma and allergies.

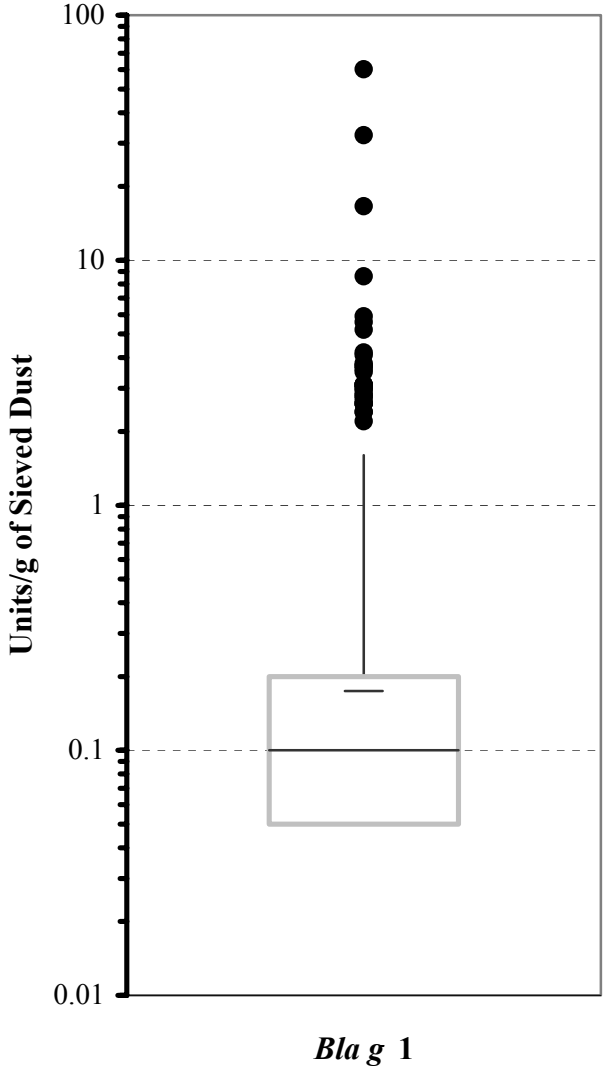
Table 2-3 Estimated empirical distribution parameters for the allergens

Parameter	*Bla g* 1 Units/gm	*Der f* 1 µg/gm	*Der p* 1 µg/gm	*Der p* 1 + *Der f* 1 µg/gm
Arithmetic Mean	0.97	1.15	0.77	1.87
Arithmetic Standard Deviation	4.69	7.52	4.08	8.63
Geometric Mean	0.17	0.09	0.09	0.13
Geometric Standard Deviation	3.61	3.85	4.17	6.09
25th Percentile	0.1	0.05	0.05	0.05
Median	0.1	0.05	0.05	0.05
75th Percentile	0.1	0.05	0.05	0.07
90th Percentile	2.7	1.1	1.1	2.7
95th Percentile	3.6	2.8	1.8	8.0
Maximum	60.1	102.9	44.6	102.9
Number of Readings	223	224	224	224

Excludes samples with an insufficient quantity of dust
Weighted estimates using room weights

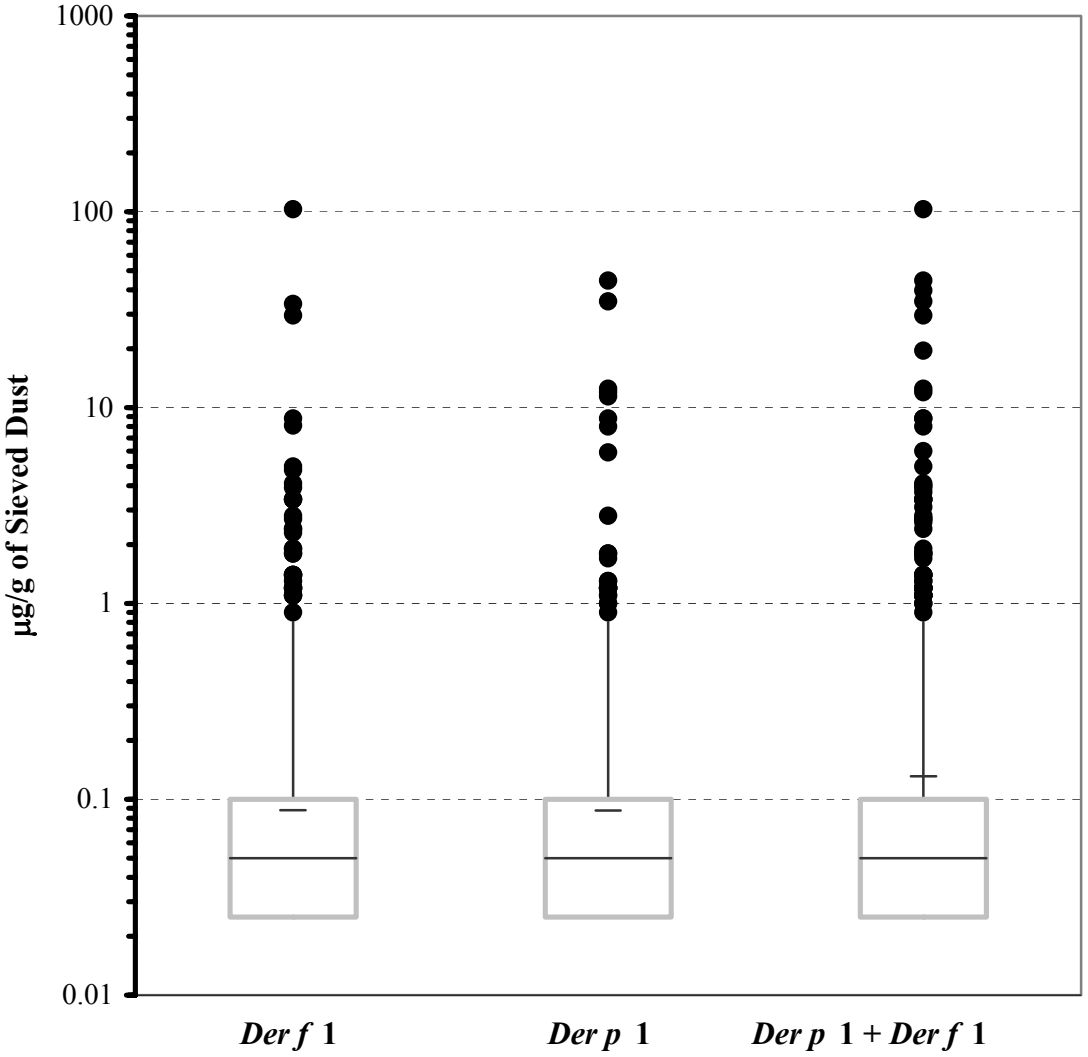
[8] These values do not add to 100 percent due to rounding.

Figure 2-1 Box plot of allergen levels for *Bla g* 1



The *Bla g* 1 concentrations are presented above in box plot form. The box in the box plot is meant to represent the middle 50 percent of the data; the bottom of the box gives the 25th percentile; the top gives the 75th percentile; and the horizontal line inside the box gives the median or 50th percentile. However, more the 75% of the observations are below the LLOD. In the data, these values were assigned a value of LLOD/2 and the 25^{th} and 75^{th} percentiles are equal. Rather than show boxes with zero height, the boxes in the box plot above have a height corresponding to a factor of two differences from the median to approximate the unknown distribution of the values below the detection limit. These boxes are shown in gray to emphasize that the true size of the box is unknown. The vertical lines (whiskers) from the top and bottom of the box extend 1.5 times with length of the box or to the largest and smallest observations, whichever is closer. Individual observations beyond the whiskers are shown as dots. Data sets approximating a log-normal distribution will produce a symmetrical box plot since the data are plotted on a log scale.

Figure 2-2 Box plot of allergen levels for *Der f* 1, *Der p* 1, and *Der p* 1 + *Der f* 1



Der f 1 and *Der p* 1 concentrations are presented in box plot form. The box in the box plot is meant to represent the middle 50 percent of the data; the bottom of the box gives the 25th percentile; the top gives the 75th percentile; and the horizontal line inside the box gives the median or 50th percentile. However, more the 75% of the observations are below the LLOD. In the data these values were assigned a value of LLOD/2 and the 25^{th} and 75^{th} percentiles are equal. Rather than show boxes with zero height, the boxes in the box plot above have a height corresponding to a factor of two differences from the median to approximate the unknown distribution of the values below the detection limit. These boxes are shown in gray to emphasize that the true size of the box is unknown. The vertical lines (whiskers) from the top and bottom of the box extend 1.5 times with length of the box or to the largest and smallest observations, whichever is closer. Individual observations beyond the whiskers are shown as dots. Data sets approximating a log-normal distribution will produce a symmetrical box plot since the data are plotted on a log scale. From this display of the data, it is possible to visually compare *Der f* 1 and *Der p* 1 allergen concentrations.

Table 2-4 presents the Pearson product correlation coefficients for each pair of allergen levels and each pair of logarithms of the allergen levels for a given sample. Figures 2-3, 2-4, and 2-5 present the scatter plots of the allergen data for these associations. When looking at the plots, remember that over half of the observations are below the LLOD and plot on top of one another at the lowest left dot.

All of the correlations are close to zero and none of the correlations are statistically significant. A significant correlation might indicate a common factor that is associated with allergen levels. The lack of significance suggests that there is no strong common factor and may in part be due to the relatively larger number of observations below the detection limit.

Table 2-4 Correlation coefficients for the allergens

Allergen	Allergen	Correlation Coefficient	P-Value
Bla g 1	*Der f* 1	-0.01	0.80
Bla g 1	*Der p* 1	-0.01	0.44
Der p 1	*Der f* 1	0.01	0.86
log (Bla g 1*)*	*log (Der f* 1*)*	0.01	0.86
log (Bla g 1*)*	*log (Der p* 1*)*	0.08	0.31
log (Der p 1*)*	*log (Der f* 1*)*	0.11	0.16

Figure 2-3 Association between all values of *Der p* 1 and *Der f* 1

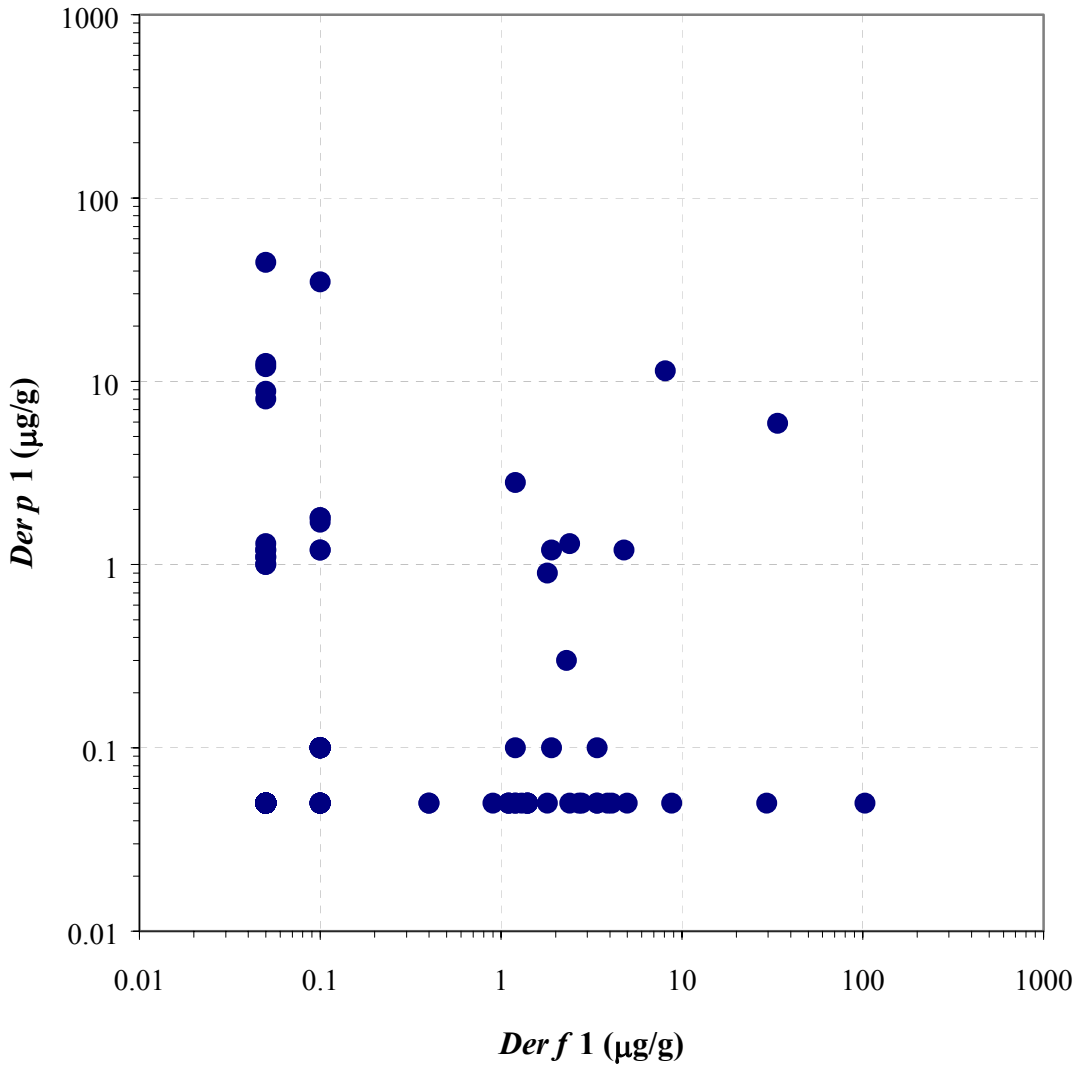


Figure 2-4 Association between all values of *Der p* 1 and *Bla g* 1

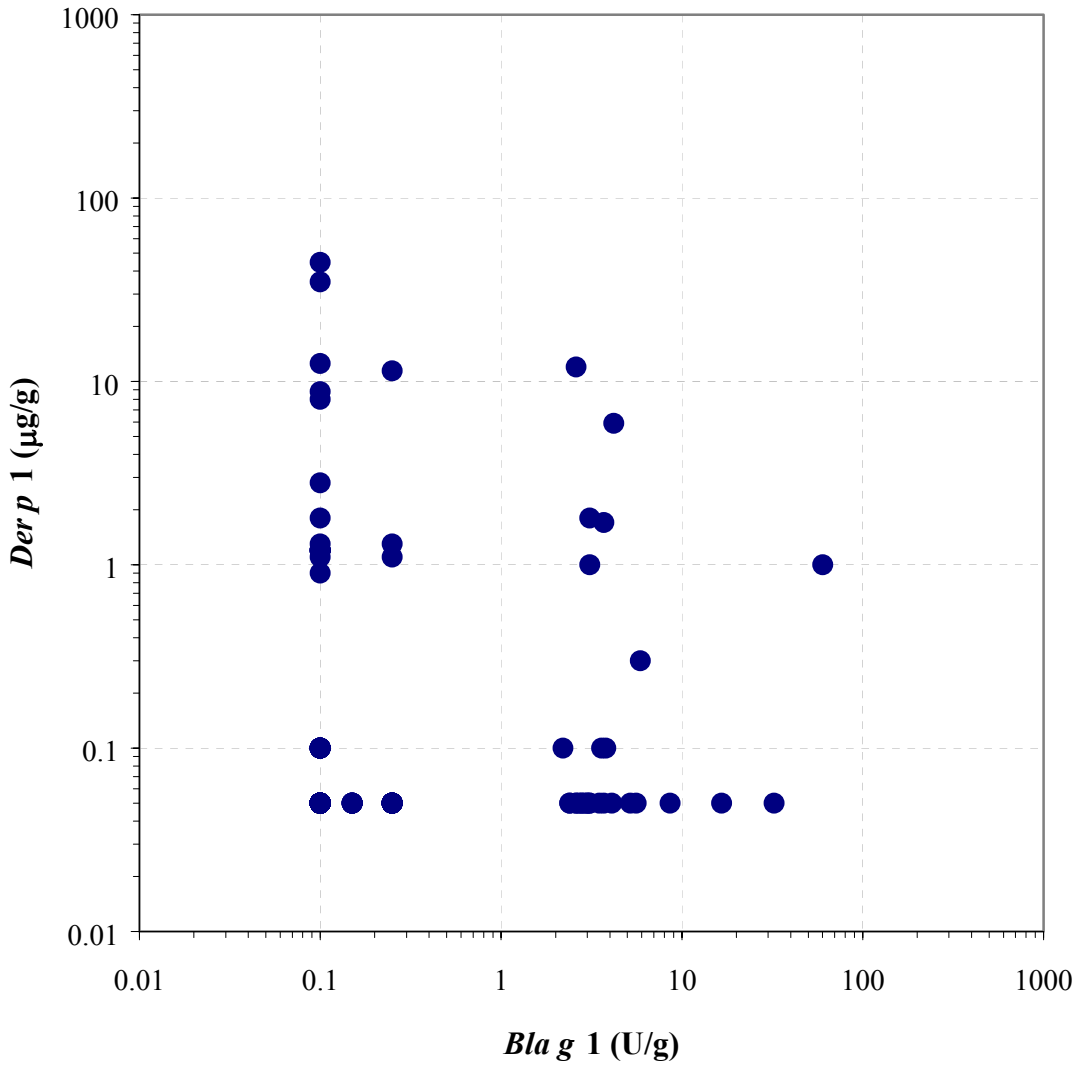
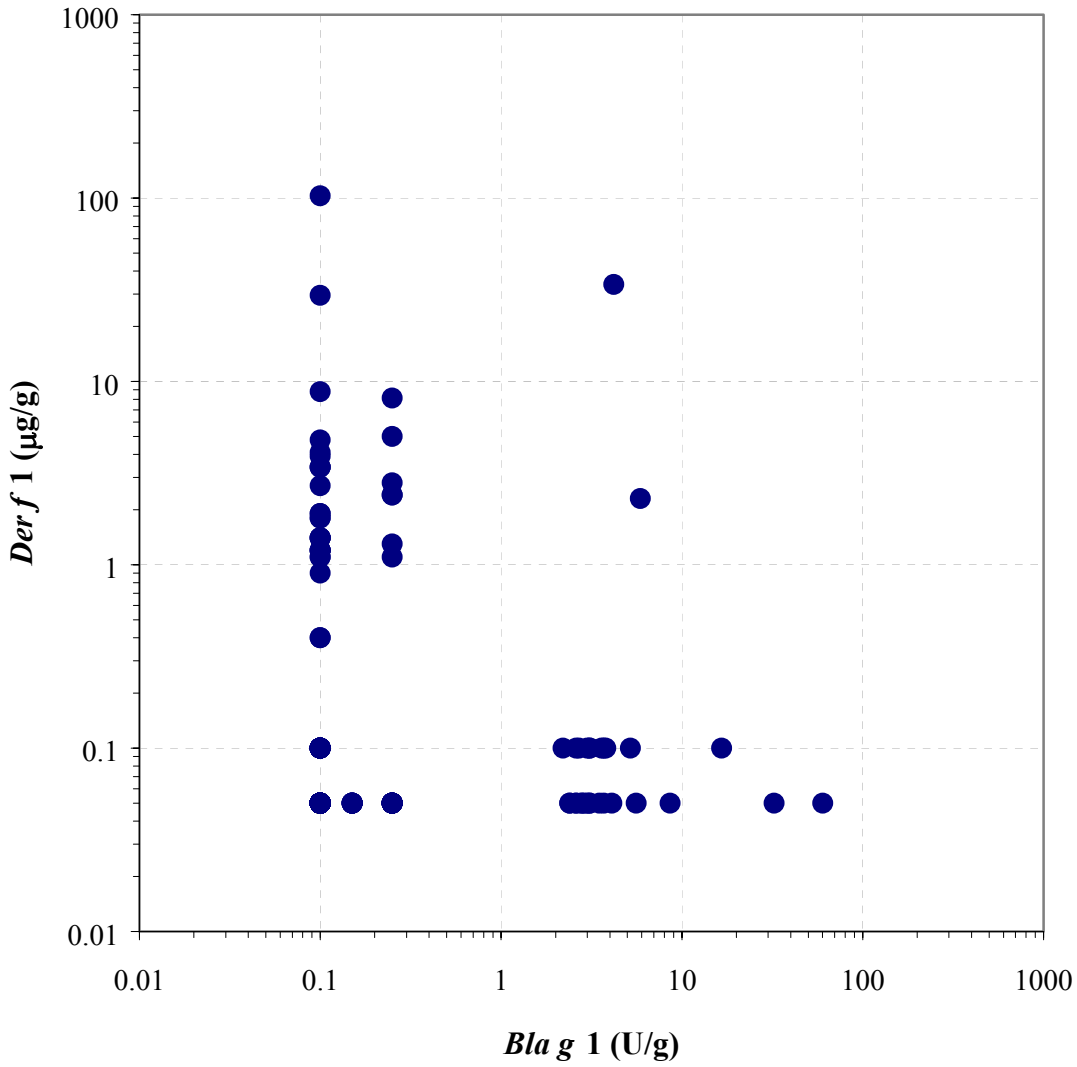


Figure 2-5 Association between all values of *Der f* 1 and *Bla g* 1



Tables 2-5a through 2-5f contain the cross tabulations of allergens in floors within selected allergen level ranges. The estimated number of child care centers that fall within each category is given in the cells of these tables. So, for example, in Table 2-5c, of the 15,000 centers with *Bla g* 1 greater than the LLOD, 10,000 have their total *Der* value less than the LLOD. These tables provide additional information on the relationship between the levels of the three allergens.

Table 2-5a Crosstabulation of allergens *Der f* 1 and *Bla g* 1

Der f 1	*Bla g* 1									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,8]	>8	Insufficient Quantity	Missing	Total
<LLOD	45,175	0	0	0	9,315	965	2,584	0	389	58,427
(LLOD, 0.5]	322	0	0	0	0	0	0	0	0	322
(0.5,1]	204	0	0	0	0	0	0	0	0	204
(1,2]	4,939	0	0	0	1,002	0	0	0	0	5,940
(2,5]	4,335	0	0	0	0	519	737	0	0	5,590
(5,10]	847	0	0	0	0	0	0	0	0	847
>10	1,161	0	0	0	263	0	0	0	0	1,423
Insufficient Quantity	0	0	0	0	0	0	0	26,263	0	26,263
Missing	0	0	0	0	0	0	0	0	935	935
Total	56,983	0	0	0	10,579	1,483	3,321	26,263	1,323	99,952

Table 2-5b Crosstabulation of allergens *Der p* 1 and *Bla g* 1

Der p 1	*Bla g* 1									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,8]	>8	Insufficient Quantity	Missing	Total
<LLOD	47,906	0	0	0	9,329	0	1,830	0	389	59,454
(LLOD, 0.5]	0	0	0	0	0	519	0	0	0	519
(0.5,1]	1,002	0	0	0	511	0	754	0	0	2,267
(1,2]	5,359	0	0	0	0	0	0	0	0	5,359
(2,5]	551	0	0	0	0	0	0	0	0	551
(5,10]	793	0	0	0	263	0	737	0	0	1,792
>10	1,372	0	0	0	477	965	0	0	0	2,813
Insufficient Quantity	0	0	0	0	0	0	0	26,263	0	26,263
Missing	0	0	0	0	0	0	0	0	935	935
Total	56,983	0	0	0	10,579	1,483	3,321	26,263	1,323	99,952

Table 2-5c Crosstabulation of allergens *Der p* 1 + *Der f* 1 and *Bla g* 1

Der p 1 + *Der f* 1	*Bla g* 1									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,8]	>8	Insufficient Quantity	Missing	Total
<LLOD	38,770	0	0	0	8,327	0	1,830	0	389	49,316
(LLOD, 0.5]	322	0	0	0	0	0	0	0	0	322
(0.5,1]	204	0	0	0	511	0	754	0	0	1,469
(1,2]	7,628	0	0	0	1,002	0	0	0	0	8,630
(2,5]	5,731	0	0	0	0	519	0	0	0	6,249
(5,10]	1,796	0	0	0	0	0	737	0	0	2,532
>10	2,533	0	0	0	739	965	0	0	0	4,237
Insufficient Quantity	0	0	0	0	0	0	0	26,263	0	26,263
Missing	0	0	0	0	0	0	0	0	935	935
Total	56,983	0	0	0	10,579	1,483	3,321	26,263	1,323	99,952

Table 2-5d Crosstabulation of allergens *Der f* 1 and *Der p* 1

Der f 1	*Der p 1*									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,10]	>10	Insufficient Quantity	Missing	Total
<LLOD	49,316	0	1,265	4,562	0	793	2,492	0	0	58,427
(LLOD, 0.5]	322	0	0	0	0	0	0	0	0	322
(0.5,1]	204	0	0	0	0	0	0	0	0	204
(1,2]	4,068	0	1,002	320	551	0	0	0	0	5,940
(2,5]	3,858	519	0	477	0	737	0	0	0	5,590
(5,10]	526	0	0	0	0	0	322	0	0	847
>10	1,161	0	0	0	0	263	0	0	0	1,423
No Sample Collected	0	0	0	0	0	0	0	26,263	0	26,263
Sample Not Analyzed	0	0	0	0	0	0	0	0	935	935
Total	59,454	519	2,267	5,359	551	1,792	2,813	26,263	935	99,952

Table 2-5e Crosstabulation of allergens *Der p* 1 + *Der f* 1 and *Der p* 1

Der p 1 + *Der f* 1	*Der p* 1									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,10]	>10	Insufficient Quantity	Missing	Total
<LLOD	49,316	0	0	0	0	0	0	0	0	49,316
(LLOD, 0.5]	322	0	0	0	0	0	0	0	0	322
(0.5,1]	204	0	1,265	0	0	0	0	0	0	1,469
(1,2]	4,068	0	0	4,562	0	0	0	0	0	8,630
(2,5]	3,858	519	1,002	320	551	0	0	0	0	6,249
(5,10]	526	0	0	477	0	1,530	0	0	0	2,532
>10	1,161	0	0	0	0	263	2,813	0	0	4,237
Insufficient Quantity	0	0	0	0	0	0	0	26,263	0	26,263
Missing	0	0	0	0	0	0	0	0	935	935
Total	59,454	519	2,267	5,359	551	1,792	2,813	26,263	935	99,952

Table 2-5f Crosstabulation of allergens *Der p* 1 + *Der f* 1 and *Der f* 1

Der p 1 + *Der f* 1	*Der f* 1									
	<LLOD	(LLOD, 0.5]†	(0.5, 1]	(1,2]	(2,5]	(5,10]	>10	Insufficient Quantity	Missing	Total
<LLOD	49,316	0	0	0	0	0	0	0	0	49,316
(LLOD, 0.5]	0	322	0	0	0	0	0	0	0	322
(0.5,1]	1,265	0	204	0	0	0	0	0	0	1,469
(1,2]	4,562	0	0	4,068	0	0	0	0	0	8,630
(2,5]	0	0	0	1,873	4,377	0	0	0	0	6,249
(5,10]	793	0	0	0	1,214	526	0	0	0	2,532
>10	2,492	0	0	0	0	322	1,423	0	0	4,237
No Sample Collected	0	0	0	0	0	0	0	26,263	0	26,263
Sample Not Analyzed	0	0	0	0	0	0	0	0	935	935
Total	58,427	322	204	5,940	5,590	847	1,423	26,263	935	99,952

Tables 2-6 through 2-9 show the number of child care centers with allergen concentrations in different ranges by child care center characteristics, including year of construction, majority race, urban city, percent of children getting government subsidies, whether children at the center have allergies or asthma, how often the center is cleaned and by whom, type of heat and air conditioning, and whether the center has cockroach problems, dampness, a mildew or musty smell, indoor pesticide application, and dehumidifier use. Table 2-6 shows data for *Bla g* 1. Table 2-7 shows data for *Der f* 1. Table 2-8 shows data for *Der p* 1. Finally, Table 2-9 shows data for the combination of *Der f* 1 and *Der p* 1.

For each level of the allergen shown in the tables, Tables 2-6 through 2-9 also show the percentage of centers by child care center characteristics (column percents). The last column in the tables shows a p-value for a chi-square test of independence of the allergen levels and the characteristics of the child care centers. The chi-square test was adjusted for the effect of the sample design. As a general rule, the results of a chi-square test are approximate if the number of observations in any cell is less than five. In some cases categories were combined to minimize the number of cells with few observations. For the same reason, the chi-square test generally excluded the Refused/Don't Know category if it had fewer than five percent of the observations. For each child care center characteristic, the shaded area shows the values that were included in the chi-square test. P-values below 0.05 indicate that there are statistically significant differences. If there are differences in the table that are statistically significant, the percentages can be used to help identify those differences that are important. Using differences among urban/non-urban categories in Table 2-6 as an example, if the allergen levels are independent of the urban city, all percentages in a row would be about the same. Fifty-one percent of centers are located in counties that include a central city. If the allergen levels and urban city are independent, approximately 51 percent of centers with different *Bla g*1 concentrations would also be in central city child care centers. However, 65 percent of centers with *Bla g* 1 greater than the LLOD are in central cities. Although this suggests that centers in central cities may have higher *Bla g* 1 levels, the differences are not statistically significant ($p = 0.18$) and thus the apparent trends may be due to random sampling variation.

None of the chi-square tests are statistically significant. This may be due to the daily cleaning and small quantities of dust found in most child care centers.

Table 2-6 *Bla g* 1 by child care center characteristics

Question	Number of Centers					Percent of Centers in Column					Chi-square Test p=Value
	All Centers	*Bla g* 1				All Centers	*Bla g* 1				
		QNS*	<LLOD	>=LLOD	Missing		QNS*	<LLOD	>=LLOD	Missing	
All Centers											
	100,000	26,300	57,000	15,400	1,300	100	100	100	100	100	
Construction Year:											
1978 - 2001	33,800	10,300	19,900	3,600	0	34	39	35	24	0	
1960 - 1977	22,900	3,000	14,500	5,000	400	23	11	25	33	29	0.61
Before 1960	29,200	9,400	16,200	3,500	0	29	36	28	23	0	
Refused/Don't Know	14,100	3,600	6,400	3,200	900	14	14	11	21	71	
Majority Race:											
White	51,300	12,200	30,300	7,400	1,300	51	46	53	48	100	
African American	26,800	8,200	15,500	3,000	0	27	31	27	20	0	0.81
Other	19,200	5,800	9,200	4,200	0	19	22	16	27	0	
Refusal/Don't Know	2,700	0	1,900	800	0	3	0	3	5	0	
Urban/Non Urban:											
Central City	51,200	14,200	26,900	10,100	0	51	54	47	65	0	
Other MSA	26,600	8,800	14,800	1,700	1,300	27	34	26	11	100	0.18
Non-MSA	22,200	3,300	15,300	3,600	0	22	12	27	24	0	
Percent of Children Getting GovtSubsidy:											
Greater than 50%	28,900	7,400	14,800	6,700	0	29	28	26	44	0	
1% - 50%	39,200	7,200	27,900	4,100	0	39	28	49	26	0	0.18
None	25,800	10,200	11,400	3,800	400	26	39	20	25	29	
Refused/Don't Know	6,000	1,500	2,900	800	900	6	6	5	5	71	
Percent of Children that Have Food or Environmental Allergies:											
1% - 50%	56,300	14,700	34,100	6,100	1,300	56	56	60	40	100	
None	27,900	6,100	17,000	4,800	0	28	23	30	31	0	0.30
Refused/Don't Know	15,800	5,400	5,900	4,400	0	16	21	10	29	0	
Percent of Children that Have Taken Asthma Medication in Last Year:											
1% - 50%	50,000	13,900	28,300	7,800	0	50	53	50	51	0	
None	40,300	10,200	24,300	4,500	1,300	40	39	43	29	100	0.68
Refused/Don't Know	9,700	2,200	4,300	3,100	0	10	8	8	20	0	
Who Cleans the Center:											
Staff Only	67,900	16,500	39,000	11,000	1,300	68	63	68	72	100	
Staff and Parents	2,500	600	1,900	0	0	3	2	3	0	0	0.92
Staff and Contractor	12,600	4,600	6,800	1,200	0	13	17	12	8	0	
Cleaning Contractor Only	16,200	4,600	9,200	2,400	0	16	18	16	15	0	
Refused/Don't Know	800	0	0	800	0	1	0	0	5	0	

Table 2-6 *Bla g* 1 by child care center characteristics (continued)

Question	Number of Centers					Percent of Centers in Column					Chi-square Test p=Value
	All Centers	*Bla g* 1				All Centers	*Bla g* 1				
		QNS*	<LLOD	>=LLOD	Missing		QNS*	<LLOD	>=LLOD	Missing	
How Often Center is Cleaned:											
Daily	93,800	24,700	54,700	13,100	1,300	94	94	96	85	100	
Other	5,400	1,500	2,300	1,500	0	5	6	4	10	0	0.42
Refused/Don't Know	800	0	0	800	0	1	0	0	5	0	
Cockroach Problems in Past 12 Months											
Yes	8,700	3,300	4,800	600	0	9	12	8	4	0	
No	90,500	23,000	52,200	14,000	1,300	91	88	92	91	100	0.52
Refused/Don't Know	800	0	0	800	0	1	0	0	5	0	
Major Heat Source:											
Electric-heated forced air (vents	31,600	9,300	16,400	5,500	400	32	35	29	36	29	
Gas-heated forced air (vents)	32,400	6,200	21,300	4,800	0	32	24	37	32	0	0.24
Radiators (steam or hot water)	18,700	7,300	9,300	1,100	900	19	28	16	7	71	
Other	8,300	3,000	4,800	600	0	8	11	8	4	0	
Refused/Don't Know	9,000	400	5,200	3,300	0	9	2	9	22	0	
Air Conditioner Used:											
Central Air Conditioning	64,800	17,200	35,200	11,400	900	65	66	62	74	71	
Window Units	18,600	6,300	10,100	2,200	0	19	24	18	15	0	0.47
Other	15,100	2,800	10,900	1,000	400	15	11	19	7	29	
Refused/Don't Know	1,400	0	700	800	0	1	0	1	5	0	
Water or Dampness due to Broken Pipes, Leaks, Heavy Rain, or Floods:											
Yes	29,500	7,300	18,300	3,900	0	30	28	32	26	0	
No	69,700	19,000	38,700	10,700	1,300	70	72	68	70	100	0.87
Refused/Don't Know	800	0	0	800	0	1	0	0	5	0	
Mildew Odor or Musty Smell:											
Yes	14,700	4,600	7,600	2,500	0	15	17	13	16	0	
No	84,100	21,300	49,400	12,100	1,300	84	81	87	79	100	0.84
Refused/Don't Know	1,200	400	0	800	0	1	2	0	5	0	
Dehumidifier Used:											
Yes	6,300	1,900	2,800	1,700	0	6	7	5	11	0	
No	91,500	24,400	54,200	12,500	400	92	93	95	81	29	0.71
Refused/Don't Know	2,100	0	0	1,200	900	2	0	0	8	71	
Indoor Pesticide Application in Past 12 Months											
Yes	62,900	14,700	37,100	10,700	400	63	56	65	70	29	
No	33,300	11,500	17,800	3,900	0	33	44	31	26	0	0.41
Refused/Don't Know	3,800	0	2,100	800	900	4	0	4	5	71	

Note: Shaded area shows values included in a chi-square tests, see right most column.

Table 2-7 *Der f* 1 by child care center characteristics

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der f* 1					All Centers	*Der f* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
All Centers													
	100,000	26,300	58,400	6,500	7,900	900	100	100	100	100	100	100	
Construction Year:													
1978 - 2001	33,800	10,300	18,200	2,300	3,000	0	34	39	31	35	38	0	
1960 - 1977	22,900	3,000	18,200	1,300	500	0	23	11	31	20	6	0	0.23
Before 1960	29,200	9,400	13,100	2,200	4,400	0	29	36	22	35	56	0	
Refused/Don't Know	14,100	3,600	8,900	700	0	900	14	14	15	11	0	100	
Majority Race:													
White	51,300	12,200	28,300	3,800	6,000	900	51	46	48	59	77	100	
African American	26,800	8,200	15,100	2,700	700	0	27	31	26	41	9	0	0.46
Other	19,200	5,800	12,300	0	1,100	0	19	22	21	0	14	0	
Refusal/Don't Know	2,700	0	2,700	0	0	0	3	0	5	0	0	0	
Urban/Non Urban:													
Central City	51,200	14,200	31,500	2,400	3,100	0	51	54	54	37	39	0	
Other MSA	26,600	8,800	12,700	1,400	2,700	900	27	34	22	22	34	100	0.41
Non-MSA	22,200	3,300	14,300	2,600	2,100	0	22	12	24	41	26	0	
Percent of Children Getting GovtSubsidy:													
Greater than 50%	28,900	7,400	17,500	2,200	1,800	0	29	28	30	34	23	0	
1% - 50%	39,200	7,200	24,900	3,500	3,600	0	39	28	43	54	45	0	0.52
None	25,800	10,200	12,400	800	2,500	0	26	39	21	12	32	0	
Refused/Don't Know	6,000	1,500	3,600	0	0	900	6	6	6	0	0	100	
Percent of Children that Have Food or Environmental Allergies:													
1% - 50%	56,300	14,700	31,000	4,000	5,600	900	56	56	53	62	71	100	
None	27,900	6,100	18,000	2,200	1,500	0	28	23	31	35	19	0	0.64
Refused/Don't Know	15,800	5,400	9,400	200	700	0	16	21	16	3	9	0	
Percent of Children that Have Taken Asthma Medication in Last Year:													
1% - 50%	50,000	13,900	28,400	3,700	4,000	0	50	53	49	58	51	0	
None	40,300	10,200	24,000	2,700	2,400	900	40	39	41	42	31	100	0.91
Refused/Don't Know	9,700	2,200	6,000	0	1,400	0	10	8	10	0	18	0	
Who Cleans the Center:													
Staff Only	67,900	16,500	38,500	5,900	6,000	900	68	63	66	92	76	100	
Staff and Parents	2,500	600	1,600	300	0	0	3	2	3	5	0	0	0.41
Staff and Contractor	12,600	4,600	6,900	0	1,200	0	13	17	12	0	15	0	
Cleaning Contractor Only	16,200	4,600	10,600	200	700	0	16	18	18	3	9	0	
Refused/Don't Know	800	0	800	0	0	0	1	0	1	0	0	0	

Table 2-7 *Der f* 1 by child care center characteristics (continued)

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der f* 1					All Centers	*Der f* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
How Often Center is Cleaned:													
Daily	93,800	24,700	55,400	6,200	6,600	900	94	94	95	96	83	100	
Other	5,400	1,500	2,300	300	1,300	0	5	6	4	4	17	0	0.72
Refused/Don't Know	800	0	800	0	0	0	1	0	1	0	0	0	
Cockroach Problems in Past 12 Months													
Yes	93,800	3,300	4,600	0	800	0	9	12	8	0	10	0	
No	90,500	23,000	53,000	6,500	7,100	900	91	88	91	100	90	100	0.61
Refused/Don't Know	800	0	800	0	0	0	1	0	1	0	0	0	
Major Heat Source:													
Electric-heated forced air (vents	31,600	9,300	18,500	1,200	2,600	0	32	35	32	19	33	0	
Gas-heated forced air (vents)	32,400	6,200	19,300	3,200	3,600	0	32	24	33	50	46	0	0.30
Radiators (steam or hot water)	18,700	7,300	8,500	300	1,600	900	19	28	15	4	21	100	
Other	8,300	3,000	4,700	700	0	0	8	11	8	11	0	0	
Refused/Don't Know	9,000	400	7,400	1,100	0	0	9	2	13	17	0	0	
Air Conditioner Used:													
Central Air Conditioning	64,800	17,200	37,600	4,000	5,100	900	65	66	64	62	64	100	
Window Units	18,600	6,300	10,300	800	1,300	0	19	24	18	12	16	0	0.96
Other	15,100	2,800	9,800	1,000	1,600	0	15	11	17	15	20	0	
Refused/Don't Know	1,400	0	800	700	0	0	1	0	1	11	0	0	
Water or Dampness due to Broken Pipes, Leaks, Heavy Rain, or Floods:													
Yes	29,500	7,300	17,100	3,600	1,600	0	30	28	29	55	20	0	
No	69,700	19,000	40,600	2,900	6,300	900	70	72	69	45	80	100	0.25
Refused/Don't Know	800	0	800	0	0	0	1	0	1	0	0	0	
Mildew Odor or Musty Smell:													
Yes	14,700	4,600	7,700	2,100	300	0	15	17	13	32	4	0	
No	84,100	21,300	50,000	4,400	7,500	900	84	81	86	68	96	100	0.43
Refused/Don't Know	1,200	400	800	0	0	0	1	2	1	0	0	0	
Dehumidifier Used:													
Yes	6,300	1,900	3,200	700	600	0	6	7	6	11	8	0	
No	91,500	24,400	54,000	5,800	7,300	0	92	93	92	89	92	0	0.97
Refused/Don't Know	2,100	0	1,200	0	0	900	2	0	2	0	0	100	
Indoor Pesticide Application in Past 12 Months													
Yes	62,900	14,700	38,800	4,200	5,300	0	63	56	66	64	67	0	
No	33,300	11,500	17,300	2,300	2,100	0	33	44	30	36	27	0	0.63
Refused/Don't Know	3,800	0	2,300	0	500	900	4	0	4	0	6	100	

Note: Shaded area shows values included in a chi-square tests, see right most column.

Table 2-8 *Der p* 1 by child care center characteristics

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der p* 1					All Centers	*Der p* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
All Centers													
	100,000	26,300	59,500	8,100	5,200	900	100	100	100	100	100	100	
Construction Year:													
1978 - 2001	33,800	10,300	21,300	300	1,900	0	34	39	36	4	36	0	
1960 - 1977	22,900	3,000	14,800	3,300	1,800	0	23	11	25	40	35	0	0.46
Before 1960	29,200	9,400	15,000	3,300	1,500	0	29	36	25	41	29	0	
Refused/Don't Know	14,100	3,600	8,400	1,300	0	900	14	14	14	15	0	100	
Majority Race:													
White	51,300	12,200	32,200	3,100	2,800	900	51	46	54	38	55	100	
African American	26,800	8,200	13,700	3,000	1,800	0	27	31	23	37	36	0	0.68
Other	19,200	5,800	12,400	500	500	0	19	22	21	6	9	0	
Refusal/Don't Know	2,700	0	1,200	1,500	0	0	3	0	2	18	0	0	
Urban/Non Urban:													
Central City	51,200	14,200	29,900	4,300	2,800	0	51	54	50	53	53	0	
Other MSA	26,600	8,800	14,700	1,300	800	900	27	34	25	16	15	100	0.67
Non-MSA	22,200	3,300	14,800	2,600	1,600	0	22	12	25	31	31	0	
Percent of Children Getting GovtSubsidy:													
Greater than 50%	28,900	7,400	16,400	4,000	1,100	0	29	28	28	50	20	0	
1% - 50%	39,200	7,200	27,600	1,800	2,600	0	39	28	46	22	50	0	0.30
None	25,800	10,200	12,600	1,500	1,500	0	26	39	21	19	30	0	
Refused/Don't Know	6,000	1,500	2,900	800	0	900	6	6	5	9	0	100	
Percent of Children that Have Food or Environmental Allergies:													
1% - 50%	56,300	14,700	34,500	4,600	1,500	900	56	56	58	57	30	100	
None	27,900	6,100	17,700	2,300	1,800	0	28	23	30	28	35	0	0.69
Refused/Don't Know	15,800	5,400	7,300	1,300	1,800	0	16	21	12	16	35	0	
Percent of Children that Have Taken Asthma Medication in Last Year:													
1% - 50%	50,000	13,900	29,000	5,100	2,000	0	50	53	49	63	39	0	
None	40,300	10,200	25,600	2,300	1,300	900	40	39	43	28	26	100	0.49
Refused/Don't Know	9,700	2,200	4,900	800	1,800	0	10	8	8	9	35	0	
Who Cleans the Center:													
Staff Only	67,900	16,500	43,000	4,300	3,200	900	68	63	72	53	61	100	
Staff and Parents	2,500	600	1,600	300	0	0	3	2	3	4	0	0	0.75
Staff and Contractor	12,600	4,600	6,500	1,500	0	0	13	17	11	19	0	0	
Cleaning Contractor Only	16,200	4,600	8,300	1,300	2,000	0	16	18	14	15	39	0	
Refused/Don't Know	800	0	0	800	0	0	1	0	0	9	0	0	

Table 2-8 *Der p* 1 by child care center characteristics (continued)

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der p* 1					All Centers	*Der p* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
How Often Center is Cleaned:													
Daily	93,800	24,700	56,400	6,600	5,200	900	94	94	95	81	100	100	
Other	5,400	1,500	3,100	800	0	0	5	6	5	9	0	0	0.78
Refused/Don't Know	800	0	0	800	0	0	1	0	0	9	0	0	
Cockroach Problems in Past 12 Months													
Yes	8,700	3,300	4,100	1,300	0	0	9	12	7	15	0	0	
No	90,500	23,000	55,300	6,100	5,200	900	91	88	93	75	100	100	0.69
Refused/Don't Know	800	0	0	800	0	0	1	0	0	9	0	0	
Major Heat Source:													
Electric-heated forced air (vents	31,600	9,300	19,400	1,100	1,900	0	32	35	33	13	36	0	
Gas-heated forced air (vents)	32,400	6,200	20,000	3,300	2,800	0	32	24	34	40	55	0	0.15
Radiators (steam or hot water)	18,700	7,300	7,400	2,500	500	900	19	28	12	31	9	100	
Other	8,300	3,000	5,300	0	0	0	8	11	9	0	0	0	
Refused/Don't Know	9,000	400	7,300	1,300	0	0	9	2	12	16	0	0	
Air Conditioner Used:													
Central Air Conditioning	64,800	17,200	40,700	2,800	3,100	900	65	66	68	34	60	100	
Window Units	18,600	6,300	9,800	1,300	1,300	0	19	24	16	16	26	0	0.44
Other	15,100	2,800	8,300	3,300	700	0	15	11	14	41	14	0	
Refused/Don't Know	1,400	0	700	800	0	0	1	0	1	9	0	0	
Water or Dampness due to Broken Pipes, Leaks, Heavy Rain, or Floods:													
Yes	29,500	7,300	16,800	3,800	1,600	0	30	28	28	47	31	0	
No	69,700	19,000	42,600	3,600	3,600	900	70	72	72	44	69	100	0.56
Refused/Don't Know	800	0	0	800	0	0	1	0	0	9	0	0	
Mildew Odor or Musty Smell:													
Yes	14,700	4,600	7,200	2,000	900	0	15	17	12	24	17	0	
No	84,100	21,300	52,200	5,400	4,300	900	84	81	88	66	83	100	
Refused/Don't Know	1,200	400	0	800	0	0	1	2	0	9	0	0	
Dehumidifier Used:													
Yes	6,300	1,900	4,500	0	0	0	6	7	8	0	0	0	
No	91,500	24,400	54,500	7,400	5,200	0	92	93	92	91	100	0	0.54
Refused/Don't Know	2,100	0	400	800	0	900	2	0	1	9	0	100	
Indoor Pesticide Application in Past 12 Months													
Yes	62,900	14,700	38,300	6,100	3,800	0	63	56	64	75	74	0	
No	33,300	11,500	19,100	1,300	1,300	0	33	44	32	16	26	0	0.47
Refused/Don't Know	3,800	0	2,100	800	0	900	4	0	3	9	0	100	

Note: Shaded area shows values included in a chi-square tests, see right most column.

Table 2-9 *Der f* 1 + *Der p* 1 by child care center characteristics

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der f* 1 + *Der p* 1					All Centers	*Der f* 1 + *Der p* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
All Centers													
	100,000	26,300	49,300	10,400	13,000	900	100	100	100	100	100	100	
Construction Year:													
1978 - 2001	33,800	10,300	16,700	2,000	4,800	0	34	39	34	19	37	0	0.28
1960 - 1977	22,900	3,000	14,100	3,500	2,300	0	23	11	29	34	17	0	
Before 1960	29,200	9,400	10,800	3,000	5,900	0	29	36	22	29	45	0	
Refused/Don't Know	14,100	3,600	7,700	1,900	0	900	14	14	16	19	0	100	
Majority Race:													
White	51,300	12,200	25,000	5,200	7,800	900	51	46	51	50	60	100	0.45
African American	26,800	8,200	11,300	3,700	3,600	0	27	31	23	35	28	0	
Other	19,200	5,800	11,800	0	1,600	0	19	22	24	0	12	0	
Refusal/Don't Know	2,700	0	1,200	1,500	0	0	3	0	2	14	0	0	
Urban/Non Urban:													
Central City	51,200	14,200	26,200	4,200	6,600	0	51	54	53	41	51	0	0.56
Other MSA	26,600	8,800	11,100	2,200	3,500	900	27	34	23	21	27	100	
Non-MSA	22,200	3,300	12,000	4,000	2,900	0	22	12	24	38	23	0	
Percent of Children Getting GovtSubsidy:													
Greater than 50%	28,900	7,400	14,000	3,700	3,800	0	29	28	28	36	29	0	0.57
1% - 50%	39,200	7,200	22,500	3,600	5,900	0	39	28	46	35	45	0	
None	25,800	10,200	10,000	2,300	3,300	0	26	39	20	22	25	0	
Refused/Don't Know	6,000	1,500	2,900	800	0	900	6	6	6	7	0	100	
Percent of Children that Have Food or Environmental Allergies:													
1% - 50%	56,300	14,700	27,700	5,000	7,900	900	56	56	56	48	61	100	0.93
None	27,900	6,100	14,500	3,900	3,300	0	28	23	29	38	26	0	
Refused/Don't Know	15,800	5,400	7,100	1,500	1,800	0	16	21	14	14	14	0	
Percent of Children that Have Taken Asthma Medication in Last Year:													
1% - 50%	50,000	13,900	24,100	5,200	6,800	0	50	53	49	50	52	0	0.89
None	40,300	10,200	21,000	4,500	3,800	900	40	39	42	43	29	100	
Refused/Don't Know	9,700	2,200	4,200	800	2,500	0	10	8	9	7	19	0	
Who Cleans the Center:													
Staff Only	67,900	16,500	34,200	6,700	9,500	900	68	63	69	64	73	100	0.99
Staff and Parents	2,500	600	1,600	0	300	0	3	2	3	0	2	0	
Staff and Contractor	12,600	4,600	5,400	1,500	1,200	0	13	17	11	15	9	0	
Cleaning Contractor Only	16,200	4,600	8,100	1,500	2,000	0	16	18	16	14	15	0	
Refused/Don't Know	800	0	0	800	0	0	1	0	0	7	0	0	

Table 2-9 *Der f* 1 + *Der p* 1 by child care center characteristics (continued)

Question	Number of Centers						Percent of Centers in Column						Chi-square Test p=Value
	All Centers	*Der f* 1 + *Der p* 1					All Centers	*Der f* 1 + *Der p* 1					
		QNS*	<LLOD	LLOD to 2.0	> 2	Missing		QNS*	<LLOD	LLOD to 2.0	> 2	Missing	
How Often Center is Cleaned:													
Daily	93,800	24,700	47,800	8,700	11,700	900	94	94	97	83	90	100	
Other	5,400	1,500	1,500	1,000	1,300	0	5	6	3	10	10	0	0.48
Refused/Don't Know	800	0	0	800	0	0	1	0	0	7	0	0	
Cockroach Problems in Past 12 Months													
Yes	8,700	3,300	3,400	1,300	800	0	9	12	7	12	6	0	
No	90,500	23,000	45,900	8,400	12,300	900	91	88	93	81	94	100	0.81
Refused/Don't Know	800	0	0	800	0	0	1	0	0	7	0	0	
Major Heat Source:													
Electric-heated forced air (vents	31,600	9,300	16,300	1,200	4,800	0	32	35	33	12	37	0	
Gas-heated forced air (vents)	32,400	6,200	16,100	3,900	6,100	0	32	24	33	37	47	0	0.07
Radiators (steam or hot water)	18,700	7,300	6,000	2,300	2,100	900	19	28	12	22	16	100	
Other	8,300	3,000	4,700	700	0	0	8	11	9	7	0	0	
Refused/Don't Know	9,000	400	6,200	2,400	0	0	9	2	13	23	0	0	
Air Conditioner Used:													
Central Air Conditioning	64,800	17,200	33,500	5,700	7,400	900	65	66	68	54	57	100	
Window Units	18,600	6,300	8,800	1,000	2,600	0	19	24	18	10	20	0	0.80
Other	15,100	2,800	7,000	2,300	3,000	0	15	11	14	22	23	0	
Refused/Don't Know	1,400	0	0	1,400	0	0	1	0	0	14	0	0	
Water or Dampness due to Broken Pipes, Leaks, Heavy Rain, or Floods:													
Yes	29,500	7,300	14,100	4,200	3,900	0	30	28	29	41	30	0	
No	69,700	19,000	35,200	5,400	9,100	900	70	72	71	52	70	100	0.71
Refused/Don't Know	800	0	0	800	0	0	1	0	0	7	0	0	
Mildew Odor or Musty Smell:													
Yes	14,700	4,600	5,700	3,500	900	0	15	17	12	34	7	0	
No	84,100	21,300	43,600	6,200	12,100	900	84	81	88	59	93	100	0.16
Refused/Don't Know	1,200	400	0	800	0	0	1	2	0	7	0	0	
Dehumidifier Used:													
Yes	6,300	1,900	3,200	700	600	0	6	7	7	7	5	0	
No	91,500	24,400	45,700	9,000	12,400	0	92	93	93	86	95	0	0.99
Refused/Don't Know	2,100	0	400	800	0	900	2	0	1	7	0	100	
Indoor Pesticide Application in Past 12 Months													
Yes	62,900	14,700	31,700	7,100	9,400	0	63	56	64	69	72	0	
No	33,300	11,500	16,100	2,500	3,100	0	33	44	33	24	24	0	0.53
Refused/Don't Know	3,800	0	1,600	800	500	900	4	0	3	7	4	100	

Note: Shaded area shows values included in a chi-square tests, see right most column.

Table 2-10 shows the number and percentage of rooms in child care centers by room type, classroom or multipurpose room. The last column in the tables shows a p-value for a chi-square test of independence of the allergen levels and the room type. Other than being oriented differently, this table uses the same format for identifying the values used in the significance test as the previous tables. None of the chi-square tests are statistically significant. Thus differences in allergen measurements between room types are not statistically significant.

Table 2-10 Allergen concentration versus room type

		Number of Rooms		Percent of Centers in Column		
Allergen	Room Type	Classrooms	Multipurpose Rooms	Classrooms	Multipurpose Rooms	Chi-square Test p-Value
Bla g 1	QNS*	112,300	17,900	37	27	0.22
	<LLOD	168,400	38,300	55	58	
	>=LLOD	22,400	9,100	7	14	
	Missing	1,600	900	1	1	
Der f 1	QNS*	112,300	17,900	37	27	0.19
	<LLOD	168,300	41,400	55	63	
	LLOD to 2.0	7,700	4,800	3	7	
	> 2	15,200	1,100	5	2	
	Missing	1,200	900	0	1	
Der p 1	QNS*	112,300	17,900	37	27	0.15
	<LLOD	162,700	44,400	53	67	
	LLOD to 2.0	19,200	800	6	1	
	> 2	9,300	2,200	3	3	
	Missing	1,200	900	0	1	
Der f 1 + *Der p* 1	QNS*	112,300	17,900	37	27	0.32
	<LLOD	144,900	39,300	48	59	
	LLOD to 2.0	21,100	5,600	7	8	
	> 2	25,200	2,500	8	4	
	Missing	1,200	900	0	1	
	All Centers	304,600	66,100	100	100	

Note: Shaded area shows values included in a chi-square tests, see right most column.

2.3 Summary of the Results

The allergen portion of the CCC survey provides estimates of the distribution of allergen levels in licensed child care centers nationally. The primary results are:

- 26 percent of centers had insufficient dust for measuring allergen levels, based on samples vacuumed from an 18 square foot floor area;
- Less than 22 percent of licensed child care centers had detectable levels of any of the three allergens tested;
- Eight percent of centers had at least one allergen with concentrations that may be associated with development of allergies;
- Allergen concentrations in child care centers are highly skewed, with many small values and a few larger values;
- Neither child care center characteristics nor room type were statistically significant predictors of allergen concentrations.

The lack of statistically significant differences and the small number of centers with detectable allergen levels has implications for future research. If allergen concentrations in dust are believed to be important even when there is very little dust on the floor, it may be necessary to collect dust from a larger sample area. However, vacuuming a larger area may cause an undesirable disruption at the child care center.

If identifying predictors of detectable or high allergen concentrations is important, it will be necessary to collect data from a larger sample of centers. For evaluating the relationship between allergen concentrations and center or room characteristics, increasing the number of centers in the sample will increase the precision of estimates, and increasing the area vacuumed may increase precision.

APPENDIX A

REFERENCES

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